Observation of the Newborn following Vacuum Assisted Birth

Identification and management of subgaleal haemorrhage

The aim of the clinical practice guideline is to facilitate an interdisciplinary approach to the prevention, early identification and prompt management of subgaleal haemorrhage in the at risk newborn.

Background

Although the rate of instrumental delivery remained steady at 10-11%, the rate of vacuum extraction compared with forceps delivery continues to rise. As the number of births using vacuum extraction has now overtaken forceps deliveries (3.5% versus 7.9%) at RPA Women and Babies, it is important to be aware of potential risks and follow clinical practice guidelines relating to the procedure - refer RPA Women and Babies Guideline for Assisted Delivery.

Extra cranial Haemorrhage

The Cochrane systematic review of trials comparing forceps and vacuum assisted delivery show lower rates of maternal morbidity with vacuum extraction but higher rates of cephalohaematoma, retinal haemorrhages and jaundice in the newborn. Nearly all infants delivered with the assistance of vacuum extraction have soft tissue sequelae to the scalp and although these injuries are usually insignificant they can cause anxiety for parents. Scalp abrasions and lacerations are common and are usually associated with more difficult vacuum deliveries such as occiput posterior positions. Retinal haemorrhages occur more commonly with vacuum assisted deliveries compared with forceps deliveries or spontaneous vaginal birth. These haemorrhages are usually transient with no long term ophthalmological sequelae.

Chignon

The chignon or artificial caput succedaneum is caused by a collection of interstitial fluid and small haemorrhages that occur under the cap. It may cross suture lines, is most obvious after immediate removal of the cap and is firm in consistency. The chignon usually starts to resolve within an hour of birth and should completely resolve within 18 hours. These have no long term significance for the newborn.

Cephalohaematoma

A cephalohaematoma is a collection of serosanguineous fluid between the periosteum and the skull bones. The reported incidence is between 1 and 25% however the clinical significance is minimal because the bleed is confined within the periosteum, limiting the amount of blood that can be lost. Cephalohaematomas do not cross suture lines and can therefore be differentiated from the more
serious complication subgaleal haemorrhage. Usually they resolve within several days but a large cephalohaematoma can take several weeks, with no treatment required.

**Subgaleal Haemorrhage**

This is the most serious complication of instrumental delivery and, while rare, is associated with significant morbidity and mortality. Subgaleal haemorrhage (SGH) can occur following normal birth, forceps delivery or Caesarean section, it most frequently occurs following vacuum assisted birth. SGH is a potentially life threatening complication and as such there should be a low threshold of suspicion in the at risk newborn.

SGH can be differentiated clinically from cephalohaematoma by the fact that it crosses suture lines. This is because the suture lines do not limit the potential space between the scalp aponeurosis and the periosteum. Figure 2. The newborn can therefore lose up to 80% of their blood volume into the subaponeurotic space resulting in hypovolaemic shock, acute anaemia, coagulopathy and death. Chang et al 9 reported an incidence of 0.6/1000 of all deliveries and 4.6/1000 of vacuum assisted births. A similar incidence of 0.4/1000 for spontaneous vaginal births and 5.9/1000 for vacuum births were described by Uchil & Arulkumuran 10. In the paper of Chang et al 9, the average age of recognition was 8 hours but SGH was not being screened for so age of commencement was almost certainly earlier than this, see Boo et al 11 below. Reported mortality from SGH has been as high as 23% 7, but in more recent literature lower mortalities than this are reported (Chadwick et al 12, 5%, Chang et al9, 12% and Boo et al 11, 2.8%). Both the incidence of SGH and mortality will be dependent on whether SGH is examined for prospectively.

Boo et al 11 published a prospective case controlled study in which all babies delivered by vacuum extraction (or exposed to vacuum) over a 26 month period were examined for SGH at birth, one hour, six hours and 24 hours. They found SGH in 21% of the babies with a median age of detection of 1 hour. The data for the range of detection age is not given but an inter quartile range of 0 suggests almost all were diagnosed close to birth. Of the babies diagnosed with SGH, 10% developed hypovolaemic shock with 28% given volume expanders. Coagulopathy was monitored for prospectively and found in 56% of babies, most of whom where given fresh frozen plasma. Two babies (2.8%) died, one from hypovolaemic shock, one from severe HIE. Vacca 13 highlighted that the incidence of SGH in this paper is high compared to the rest of the literature. Its unclear whether this reflected a high diagnostic rate from the surveillance or a truly high incidence.

In terms of intrapartum risk factors, observational studies have suggested that SGH is often (but not always), preceded by a difficult vacuum extraction with either incorrect positioning of the cup, prolonged extraction time (greater than 20 minutes), more than three pulls or greater than two cup detachments or failed vacuum extraction 12,13. These observations are not all confirmed in the case control analysis in the study of Boo et al 11. This study showed significant risk factors for SGH were nulliparity (adjusted OR 4.0), 5 minute Apgar score < 8, (OR 5.0), cup marks on the sagittal suture (OR 4.4), leading edge of cup < 3cms from anterior fontanelle (OR 6.0) or failed vacuum extraction (OR 16.4). This study did not find that the number of pulls or the number of times the cup was re-applied were significant risk factors. In the SGH babies, 49% had only one pull and in 84%, there was no reapplication of the suction cup.

**Recognition of subgaleal haemorrhage (SGH)**

**Local signs**

SGH is often recognised late because the blood loss moulds to the shape of the skull and scalp. This means if the scalp is observed by visual inspection alone rather than a combination of inspection and palpation, it is easy to miss an SGH.

Signs can be vague but the presence of a SGH should always be considered if there a generalised swelling or a boggy consistency of the scalp especially at the cup site. As the haemorrhage collects the scalp becomes fluctuant on palpation the scalp has been described as fluidic or like a leather pouch filled with fluid. It is this perception of free fluid between the scalp and the skull that is critical to the clinical recognition of SGH. The haemorrhage is not contained by suture lines and the infant can lose a substantial amount of blood into the subaponeurotic space before this swelling of the scalp is observed. As the haemorrhage extends, elevation and displacement of the ears lobes and peri orbital oedema (puffy eyelids) can be observed. Irritability and pain on handling will be noted.
Figure 3 Uniform swelling moulding to the shape of the scalp due to a SGH demonstrating the visual subtlety of an SGH. This baby did not develop shock but did need a blood transfusion.

Figure 4 - Again showed the uniform swelling moulding to the shape of scalp with downward displacement of the ears. This is a massive SGH in a baby who developed coagulopathy and hypovolaemic shock.

In summary, consider SGH if on palpation:

1. The scalp is mobile relative to the skull bones underneath.
2. There is fluid moving freely between the scalp and skull and
3. This fluid is not contained by the suture lines.

Systemic signs

The systemic signs of a SGH relate to blood loss and the diagnosis should be immediately considered in infants with a 5 minute Apgar score less than 7 without evidence of asphyxia and following a difficult / complicated or failed vacuum assisted birth. Later signs will be consistent with acute blood loss tachycardia, tachypnoea, poor activity, pallor, hypotension and acidosis.

Neonatal Surveillance

The following levels of surveillance are adapted from the RANZCOG Recommendations (2009)6

All neonates delivered by vacuum extraction should have intramuscular vitamin K immediately following birth. If consent for IM Vitamin K is refused, parents should be counselled about the risks, including the risk of SGH.

All babies delivered by vacuum extraction should have scalp observations as detailed below but midwives need to be especially vigilant
due to extra risk if one of more of the following is occurs:

1. Failed vacuum extraction
2. Difficult extraction
3. Placement of the vacuum cup over the sagittal suture near the anterior fontanelle.

Formal neonatal observations should commence soon after birth as most SGH will be apparent in the early postnatal period. Observations as below should then be repeated at one hour, four hours and 8 hours.

Hats/bonnets should not be used, so as to allow visual inspection of the scalp. The primary observation on each occasion will be to inspect and palpate scalp and assess the following:

1. Palpate to assess for resolution of the chignon.
2. Palpation to note any ballotable mass or movement of fluid (gravity dependent) in scalp, note colour and head shape including displacement of ears or pitting oedema.
3. Document all observations on the postnatal Newborn Care Plan.

If there are any concerns about the presence of an SGH, the neonatal medical staff should be informed and requested to attend and further observations should include - heart rate, respiratory rate, colour (pallor) and activity. Application of a pulse oximeter may prove useful to detect progressive tachycardia and poor perfusion.

**Action if there is a clinical suspicion of SGH.**

Clinical suspicion of subgaleal haemorrhage (SGH) immediately following delivery or abnormalities reported with routine surveillance.

These infants need urgent review by senior registrar, Fellow or duty staff specialist. If concerns about the possibility of SGH are confirmed, then these infants will be immediately admitted to Newborn Care, for immediate resuscitation (if required) and further laboratory assessment and support.

**Management of Subgaleal Haemorrhage (SGH)**

Symptomatic SGH is a medical emergency with a mortality rate. Early recognition with a low threshold of suspicion is essential to initiate timely and effective management.

Focus of management will be volume replacement and monitoring for, and correction of, any coagulopathy.

**Initial action**

- Nurse on open care system with servo (baby) control in intensive care
- Apply cardio respiratory and pulse oximeter (pre-ductal)
- Secure intravenous access should be established.
- Initiate strict fluid balance documentation.
- Measure head circumference.
- If there is concern about systemic perfusion, an arterial line should be inserted and blood pressure monitoring initiated.

**Immediate Investigations**

- Coagulation profile: This should be performed on admission and then repeated as detailed below.
- Full blood count HCT can be done on the unit if needed urgently
- Group & blood x match (notify blood bank on # 58033 if urgent)
- Arterial blood gases including lactate
- Urgent NBST if transfusion likely
- Blood glucose level maintain above 2.6mmol/L
- Electrolytes
- Stabilisation should not be delayed by attempts to confirm the diagnosis with imaging but point of care ultrasound will allow demonstration of the location of the haemorrhage.

**Continuing monitoring**
- Continuously monitor heart rate, respiration. Oxygen saturation and blood pressure (non-invasively if no arterial line).
- Continue to assess capillary refill and peripheral perfusion.
- Regularly observe and palpate scalp swelling to assess for continuing blood loss, look for size of ballotable mass, change in head shape or head circumference, change in colour, displacement of ears.
- Monitor urine output.
- Repeat FBC and coagulations studies, (4-6 hours after initial assessment).

**Management of SGH:**

The basis of effective management is aggressive resuscitation to restore blood volume, provide circulatory support, correction of acidosis and coagulopathy.

- If coagulation studies are abnormal then correct with 20 mls/kg of Fresh Frozen Plasma. Repeat coagulation studies after FFP to confirm correction.
- If there is continued bleeding or the fibrinogen level are less than 1.5g/l, then consider giving Cryoprecipitate 5 mls/kg, repeated if necessary.
- If thrombocytopenic, consider platelet transfusion. Definitely give platelet transfusion if platelet count is less than 80,000.

**Recognition of Hypovolaemia**

Pointers to significant volume loss include:

- A high or increasing heart rate (>160 bpm)
- A low or falling haemoglobin or haematocrit
- Poor peripheral perfusion with slow capillary refill (>3 seconds)
- A low or falling blood pressure (MBP<40 mmHg in a term baby)
- Presence of or worsening of a metabolic acidosis.
- Echocardiography can be useful in assessment of volume status. Small systemic veins and low ventricular filling volumes can be pointers to hypovolaemia.

**Volume Replacement**

- If clinically hypovolaemic then give initial volume replacement at 20mls/kg of Normal Saline over 20 minutes or more quickly if hypovolaemia is severe. If the hypovolaemia at presentation is severe, then uncrossmatched O negative blood and fresh frozen plasma should be requested urgently to be given as soon as available, but start with Normal Saline while waiting for this.
- To order uncrossmatched O negative blood:
  - Ring blood bank on 58033 and ask for Paediatric pack of uncross-matched O negative blood.
  - The routine in Blood Bank is to irradiate this which takes 10 minutes. If the clinical situation will not allow a 10 minute delay, specify that you dont want it irradiated.
  - Send someone urgently to collect the blood from blood bank.
- Order fresh frozen plasma and cross matched red blood cells from the blood bank.
- Give further volume as FFP and then red blood cells as clinically indicated. Note; as coagulopathy is common, early use of FFP is important. If a baby is hypovolaemic from an SGH, they will likely need a red blood cell transfusion.
- Acidosis will usually correct with appropriate volume replacement and persistence of a metabolic acidosis may be a pointer to persisting hypovolaemia.

**Parents**

Keep parents informed and obtain consent for the administration of blood products. Reassure and keep communication open and honest.

**References**


RPA Newborn Care Clinical Practice Guidelines December 2009
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